Snow Cover

Product Description

Global snow cover (including ice on large, inland water bodies) will be mapped daily and weekly over the Earth's land surfaces at 500-m resolution using the SNOMAP algorithm (Hall, *et al.*, 1995). A global, daily snow cover map will be an at-launch MODIS product. Snow cover, with its high albedo, is a key parameter of the global energy balance, reflecting much of the incident solar radiation back to space. Snow cover of the Northern Hemisphere is currently mapped by NOAA on a weekly basis, but the accuracy of the maps has been difficult to determine, in part, because a variety of techniques has been used to map snow cover over the almost 30-year period during which the maps have been produced.

Additionally, snow/cloud discrimination is difficult and often impossible using the current NOAA sensors because of the available bands. MODIS bands will allow automatic snow/cloud discrimination, and, in conjunction with the cloud mask to be produced by another MODIS investigator, will allow automated snow mapping. The MODIS weekly snow-cover product is designed to provide snow-cover persistence statistics for each pixel so that users can determine how long the snow has been on the ground during a compositing period selected by the user. This is especially important during the transition seasons.

Research & Applications

Large, inland water bodies such as the Great Lakes, are often ice-covered during the winter months, and navigation during part of the winter is a significant problem. NOAA data are currently used to map ice cover on the Great Lakes, but snow/ice and cloud discrimination is a problem. Additionally, ice cover on lakes can be an important climate indicator, as the dates of freeze-up and break-up are influenced by meteorological conditions. A trend toward earlier break-up, for example, could signify a warming as has been observed in some areas (e.g., Comb, 1990). Thus, it is important to measure ice conditions on large lakes over an extended period of time in order to detect trends as well as for operational uses over the short term.

Data Set Evolution

SNOMAP has a considerable heritage. It is based on the normalized difference of a visible and a shortwave-infrared band. This technique has been used, since at least 1978, to map snow from aircraft (Kyle, *et al.*, 1978). Since the mid-1980s, it has been used to map snow using Landsat data on the drainage-basin scale (Dozier, 1989).

Global snow cover has also been mapped using passive-microwave data at a resolution of about 50 km^2 (Foster and Chang, 1993). While these data allow snow mapping through cloud cover, passive-microwave data do not provide a resolution that is suitable for detailed snow mapping. Basin-scale mapping is required for hydrological modeling, and, in particular for snowmelt-runoff calculations which are essential for hydroelectric-power generation and for water-supply forecasts in the western U.S. and in

MOD 10, MOD 33
PRODUCT SUMMARY

Coverage:
global, daytime

Spatial/Temporal Characteristics:
500 m × 500 m daily (Level 2 MOD 10) and 500 m × 500 m weekly (Level 3 mapped-MOD 33).

Key Geophysical Parameters:
snow cover, lake ice cover

Processing Level:
2, 3

Product Type:
MOD 10 - standard, at-launch
MOD 33 - standard, at launch

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many other parts of the world. The expected use of passive-microwave and MODIS snow-cover data together should yield information on snow extent and snow-water equivalent (Salomonson, *et al.*, 1995). Snow-cover data are also needed for general circulation modeling.

Suggested Reading

Comb, D.G., 1990.

Dozier, J., 1989.

Foster, J.L. and A.T.C. Chang, 1993.

Hall. D.K., *et al.*, 1995.

Kyle, H.L., *et al.*, 1978.

Salomonson, V.V., *et al.*, 1995.